

CLAIMS

1. A three-dimensional structure verification supporting apparatus for supporting verification of an artificial three-dimensional structure by verifying properness of a three-dimensional simulated image simulated in order to indicate a three-dimensional structure of a substance, comprising:

a first displaying unit for displaying an simulated three-dimensionally shaded model image assumingly indicating the three-dimensional structure of the substance by shading the three-dimensional simulated image; and

a second displaying unit for displaying the three-dimensional image of the substance acquired by experimental structural analysis, wherein

the simulated three-dimensionally shaded model image and the experimental image rotate synchronously.

2. The three-dimensional structure verification supporting apparatus as claimed in claim 1, wherein said second displaying unit displays the substance rotationally as if three-dimensional model rotates by sequentially displaying a plurality of shaded two-dimensional images in order of angle as the image, the images being acquired from a plurality of angles.

3. The three-dimensional structure verification supporting apparatus as claimed in claim 2, wherein the two-dimensional images are gray-scale images acquired by a transmission electron microscope.

4. The three-dimensional structure verification supporting apparatus as claimed in claim 1, wherein the simulated three-dimensionally shaded model image is acquired by processing

a plurality of gray-scale image acquired by a transmission electron microscope.

5. The three-dimensional structure verification supporting apparatus as claimed in claim 3, further comprising a three-dimensional image generating unit comprising:

a shape simulating unit for simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles;

a distributing unit for generating gray-scale density-distribution by extending density indicated in the gray-scale image to an angle by which the gray-scale image is captured, and distributing the density;

a second integrating unit for generating a three-dimensional gray-scale data which indicates the substance by three-dimensional image data by integrating the plurality of gray-scale density-distribution by the plurality of gray-scale image acquired from a plurality of angles;

a first integrating unit for integrating the three-dimensional gray-scale data by the second integrating unit on the shape data; and

a data processing unit for generating the three-dimensional image by extracting only the gray-scale data existing in circumference of a shape indicated by the shape data among the three-dimensional gray-scale data.

6. The three-dimensional structure verification supporting apparatus as claimed in claim 3, further comprising a three-dimensional image generating unit comprising:

a shape simulating unit for simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles; and

an image data generating unit for generating a three-dimensional simulated image by distributing the gray-scale data of the gray-scale image around the outline.

7. A three-dimensional structure verification method of verifying a three-dimensional structure by verifying a three-dimensional simulated image simulated in order to indicate a three-dimensional structure of a substance, comprising steps of:

displaying an simulated three-dimensionally shaded model image, which is a shaded image of the three-dimensional simulated image, and an image acquired by an experimental structural analysis, with the images rotating synchronously; and

verifying a three-dimensional structure by comparing the simulated three-dimensionally shaded model image with the experimental image.

8. The three-dimensional structure verification method as claimed in claim 7, whereby the image of the substance is displayed rotationally as if three-dimensional model rotates by sequentially displaying a plurality of shaded two-dimensional images in order of angle as the image, the images being acquired from a plurality of angles.

9. The three-dimensional structure verification method as claimed in claim 8, whereby the two-dimensional images are gray-scale images acquired by a transmission electron microscope.

10. The three-dimensional structure verification method as claimed in claim 7, whereby the simulated three-dimensionally shaded model image is acquired by processing a plurality of gray-scale image acquired by a transmission electron microscope.

11. The three-dimensional structure verification method as claimed in claim 7, further comprising steps of:

simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles;

generating gray-scale density-distribution by extending density indicated in the gray-scale image of the substance acquired by a projection image capturing apparatus to an angle by which the gray-scale image is captured, and distributing the density;

generating three-dimensional gray-scale data which indicates the substance by three-dimensional image data by integrating the plurality of gray-scale density-distribution by the plurality of gray-scale image acquired from a plurality of angles;

integrating the three-dimensional gray-scale data of the shape data; and

generating the three-dimensional simulated image by extracting only the gray-scale data existing in circumference of an outline indicated by the shape data among the three-dimensional gray-scale data.

12. The three-dimensional structure verification method as claimed in claim 7, further comprising steps of:

simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles; and

generating a three-dimensional simulated image by distributing the gray-scale data of the gray-scale image around the outline.

13. A recording medium storing thereon a program for supporting verification of an artificial three-dimensional structure by verifying a three-dimensional simulated image simulated in order to indicate a three-dimensional structure of a substance, wherein the program comprises:

 a first displaying module for displaying an simulated three-dimensionally shaded model image, which is a shaded image of the three-dimensional simulated image; and

 a second displaying module for displaying the image of the substance acquired by experimental structural analysis, and

 the simulated three-dimensionally shaded model image and the experimental image rotate synchronously.

14. The recording medium as claimed in claim 13, wherein the program further comprises:

 a shape simulating module for simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles;

 a distribution module for generating gray-scale density-distribution by extending density indicated in the gray-scale image acquired by a transmission electron microscope to an angle by which the gray-scale image is captured, and distributing the density;

 a second integrating module for generating a three-dimensional gray-scale data which indicates the substance by three-dimensional image data by integrating the plurality of gray-scale density-distribution by the plurality of gray-scale image acquired from a plurality of angles;

 a first integrating module for integrating the three-dimensional gray-scale data by the second integrating unit on the shape data; and

 a data processing module for generating the

three-dimensional image by extracting only the gray-scale data existing in circumference of a shape indicated by the shape data among the three-dimensional gray-scale data.

15. The recording medium as claimed in claim 13, wherein the program comprises:

a shape simulating module for simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles; and

an image data generating module for generating a three-dimensional simulated image by distributing the gray-scale data of the gray-scale image acquired by a transmission electron microscope around the outline.

16. A program for supporting verification of an artificial three-dimensional structure by verifying a three-dimensional simulated image simulated in order to indicate a three-dimensional structure of a substance, comprising:

a first displaying module for displaying an simulated three-dimensionally shaded model image, which is a shaded image of the three-dimensional simulated image; and

a second displaying module for displaying the image of the substance acquired by experimental structural analysis, wherein

the simulated three-dimensionally shaded model image and the experimental image rotate synchronously.

17. The program as claimed in claim 16, further comprising:

a shape simulating module for simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles;

a distribution module for generating gray-scale density-distribution by extending density indicated in the gray-scale image acquired by a transmission electron microscope to an angle by which the gray-scale image is captured, and distributing the density;

a second integrating module for generating a three-dimensional gray-scale data which indicates the substance by three-dimensional image data by integrating the plurality of gray-scale density-distribution by the plurality of gray-scale image acquired from a plurality of angles;

a first integrating module for integrating the three-dimensional gray-scale data by the second integrating unit on the shape data; and

a data processing module for generating the three-dimensional image by extracting only the gray-scale data existing in circumference of a shape indicated by the shape data among the three-dimensional gray-scale data.

18. The program as claimed in claim 16, further comprising:

a shape simulating module for simulating shape data indicating an outline of the substance using a plurality of first image data of the substance captured from a plurality of angles; and

an image data generating module for generating a three-dimensional simulated image by distributing the gray-scale data of the gray-scale image acquired by a transmission electron microscope around the outline.